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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/136,342 08/19/98 FORREST

S 10020/11901

EXAMINER

.IM62/0201

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ART UNIT	PAPER NUMBER

1774
DATE MAILED:

10

02/01/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

MR4
01/31/00

Office Action Summary

Application No.
09/136,342

Applicant(s)
Stephen R. FORREST et al.

Examiner
M. Yamnitzky

Group Art Unit
1774



☐ Responsive to communication(s) filed on _____

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire three (3) month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) 1-53 is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-53 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been
☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 5-7 & 10

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

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1. The Declaration lists the inventors in a different order than listed on the patent application transmittal letter. According to the transmittal letter, the inventors of the present application should be identified as "Forrest et al." whereas according to the executed declaration, the inventors should be identified as "Bulovic et al." Should the present application eventually be found to be allowable, this discrepancy is likely to lead to problems in the allowance/printing process.

A substitute Declaration is required to correct the issue noted above.

2. The drawings filed 08/19/98 are not objected to by the Draftsperson under 37 CFR 1.84 or 1.152.

3. The two U.S. patent applications cited in the IDS filed 11/23/98 that have issued as U.S. patents have been added to the U.S. Patent list on the form. All citations of U.S. patent applications have been crossed off the list of other documents since these applications are not available to the general public. Should any of the copending applications issue as a U.S. patent during prosecution of the present application, the patent will be made of record via a PTO-892 by the examiner.

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4. Claims 7-11, 16, 18, 25-28, 30-37 and 42-50 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 and dependents: It is not clear if the non-metallic conductive layer "consists of" or merely "comprises" a conductive oxide.

Claim 10 and dependents: It is not clear if the non-metallic conductive layer "consists of" or merely "comprises" a conductive polymer.

Claim 11: "polyaniline" should read --polyaniline--.

Claim 16: It is not clear if "magnesium silver" indicates an alloy, or if some other structure is allowed by this terminology.

Claim 18: It is not clear if the metallic layer "consists of" or merely "comprises" the recited alloy.

Claims 25 and 26: It is not clear if one of the two photoconductive organic layers consists of/comprises one of the recited compounds, with the other of the two organic layers consisting of/comprising the other recited compound, or if the two compounds may be present in both organic layers.

Claims 27 and 28: It is not clear if both of the two transparent electrode layers are required to comprise indium tin oxide.

Claim 31's reference to aluminum tris(8-hydroxyquinoline) and 4,4'-bis[N-(1-naphthyl)-N-phenyl-amino]biphenyl as photoconductive organic "dyes" confuses the scope of

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“photoconductive organic dyes” as required for claim 30 and dependents, and confuses the scope of “organic dyes” as required for claim 36 and dependents because these two compounds are not conventionally considered to be “dyes”. It is not known what other compounds that are not conventionally considered to be “dyes” may be within the scope of “photoconductive organic dyes” and “organic dyes” as recited in claims 30 and 36.

Claim 30 and dependents: It is not clear if the inner pair of layers “consist of” or merely “comprise” a pair of photoconductive organic dyes. It is not clear if the pair of photoconductive organic dyes is in each layer of the inner pair of layers.

Claim 36 and dependents: It is not clear if the two photoconductive organic layers “consist of” or merely “comprise” a pair of organic dyes. It is not clear if the pair of organic dyes is in each of the two photoconductive organic layers.

Claim 37: It is not clear if each metallic layer is considered to be part of a transparent electrode layer. If so, reference to the electrode layers as “non-metallic conductive layers” is confusing. If not, it is not clear if the metallic layers are required to be transparent.

Claims 42-44: It is not clear if the plurality of photoconductive organic layers “consist of” or merely “comprise” materials selected from the recited group.

Claims 45-49: It is not clear if the substrate “consists of” or merely “comprises” the material recited in each of these claims.

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Claims 45, 46, 48 and 49: The scope of a "flexible" material, a "rigid" material, an "opaque" material, and a "reflective" material, as modified by the term "substantially", is not clear.

Claim 48: The requirement for a substrate that is a substantially opaque material in combination with two transparent electrode layers is confusing. It is not clear if a transparent electrode layer on a substrate comprising or consisting of a substantially opaque material provides any function not provided by an electrode layer which is not transparent.

Claim 49: It is not clear what the substantially reflective material must reflect. Is the material required to reflect electromagnetic radiation of a particular wavelength or wavelength range?

It is not clear if claim 50 is claiming only the device of claim 2, or if claim 50 is claiming a multipixel photodetector comprising the device of claim 2.

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-8, 13, 19-22, 38, 39, 45-48 and 50-53 are rejected under 35 U.S.C. 102(b) as being anticipated by Komp (3,789,216).

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For example, see column 1, lines 6-13, c. 1, l. 65 to c. 2, l. 38, c. 2, l. 59 to c. 3, l. 50, c. 4, l. 38-59, and the Examples.

7. Claims 1-8, 13, 19-22, 38, 39, 46-48, 51 and 53 are rejected under 35 U.S.C. 102(b) as being anticipated by Kay et al. (3,900,945).

For example, see column 1, lines 34-60, c. 2, l. 41 to c. 3, l. 2, and c. 3, l. 30-42.

8. Claims 1-9, 13, 14, 19, 21, 22, 38, 39, 46, 47 and 50-53 are rejected under 35 U.S.C. 102(b) as being anticipated by Zinchuk (4,060,426).

For example, see column 1, line 13 to c. 2, l. 3, c. 2, l. 29-51, c. 3, l. 62 to c. 5, l. 21, c. 7, l. 53 to c. 8, l. 45 and c. 9, l. 37-47.

9. Claims 1-5, 7-11, 13, 14, 19, 21, 23, 24, 38-40, 42, 45-48 and 50-53 are rejected under 35 U.S.C. 102(b) as being anticipated by Sariciftci et al. (5,331,183).

For example, see column 1, lines 7-37, c. 3, l. 59 to c. 4, l. 6, c. 5, l. 37 to c. 6, l. 17, c. 7, l. 8-16, c. 8, l. 18-26, c. 9, l. 21-32, c. 9, l. 57-60 and claims 5-12.

10. Claims 1-9, 19, 20, 22-28, 36, 38, 39, 46, 47 and 50-53 are rejected under 35 U.S.C. 102(b) as being anticipated by Karl et al. "Efficient Organic Photovoltaic Cells", pp. 243-258, *Mol. Cryst. Liq. Cryst.*, 1994, Vol. 252.

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See the whole article. In particular, see pages 247-253.

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 1-9, 13, 14, 19, 20, 29, 30, 32-35, 38, 40, 42-47 and 50-53 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Suzuki et al. (5,350,459).

See the whole patent. In particular, see column 1, lines 6-9, c. 4, lines 3-23, c. 4, l. 39-49, c. 40, l. 33-44, c. 41, l. 20-34, and c. 43, l. 19-25.

Suzuki et al. require that "at least one" of the first electrode or second electrode be transparent. Although there is no requirement for two transparent electrodes, two transparent electrodes is clearly within the scope of Suzuki's "at least one". Further, in addition to the disclosure regarding a transparent electrode at c. 40, l. 38-44, Suzuki et al. disclose a back electrode made of metal having a thickness as small as 50 Å. A back electrode having such a small thickness, particularly of the preferred metal (gold), would inherently transmit light.

In the alternative, based on Suzuki's teaching of "at least one" transparent electrode, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the organic photovoltaic element of Suzuki et al. with two transparent electrodes so as to attain

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the advantages provided by having two transparent electrodes such as being able to expose the photoconductive layers to electromagnetic radiation through either electrode.

13. Claims 1-9, 13, 14, 19, 20, 38-44, 46, 47 and 50-53 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Forrest et al. (5,315,129).

See the whole patent. In particular, see column 1, line 64 to c. 2, l. 54, c. 5, l. 8-23, c. 6, l. 18-68 and c. 8, l. 11 to c. 9, l. 5.

In describing Organic Multiple Quantum Well Photodetectors in column 6, Forrest et al. teach that "one or both of the contacts should be transparent". Thus, two transparent electrodes are clearly within the scope of Forrest et al.

In the alternative, based on Forrest's teaching that "one or both of the contacts should be transparent", it would have been obvious to one of ordinary skill in the art at the time of the invention to make Forrest's photodetector with two transparent electrodes so as to attain the advantages provided by having two transparent electrodes such as being able to detect light through either electrode of the photodetector.

14. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over any one of Komp, Kay et al., Zinchuk, Karl et al., Suzuki et al. or Forrest et al. as applied in the separate rejections above, and further in view of Sariciftci et al.

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All of the primary references disclose photosensitive optoelectronic devices which may have two transparent electrode layers, but none of the primary references disclose a device wherein at least one of two transparent electrodes is a non-metallic conductive layer comprising or consisting of a conductive polymer which is polyaniline. Each of the primary references disclose conductive metal oxides as materials for transparent electrodes.

Sariciftci et al. teach the use of conducting polymers such as polyaniline to make a transparent conducting electrode for a photosensitive optoelectronic device. Sariciftci et al. disclose conducting polymers as an alternative to conductive metal oxides such as indium/tin oxide.

It would have been obvious to one of ordinary skill in the art at the time of the invention to substitute a conducting polymer such as polyaniline for a conductive metal oxide to make a transparent electrode for the devices of the primary references. One of ordinary skill in the art would have been motivated to do so by Sariciftci's teaching of conductive polymers as equivalents of conductive metal oxides in the manufacture of transparent electrodes.

15. Claims 12 and 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over any one of Komp, Kay et al., Zinchuk, Sariciftci et al., Suzuki et al. or Forrest et al. as applied in the separate rejections above, and for the further reasons set forth below.

None of the applied references explicitly disclose a transparent electrode comprising a non-metallic conductive layer and a metallic layer as required by claims 12, 17 and 18, or a

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metallic/non-metallic composite cathode as required by claims 15 and 16. Absent a showing of superior/unexpected results provided by the use of a multilayer electrode or a composite cathode, it is the examiner's position that it would have been within the level of ordinary skill of a worker in the art at the time of the invention to select suitable electrode materials and combinations of electrode materials to provide a functional device.

16. Claims 12, 15-18 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Karl et al. as applied under 35 U.S.C. 102(b) above, and for the further reasons set forth below.

Karl et al. does not disclose a transparent electrode comprising a non-metallic conductive layer and a metallic layer as required by claims 12, 17, 18 and 37, or a metallic/non-metallic composite cathode as required by claims 15 and 16. Absent a showing of superior/unexpected results provided by the use of a multilayer electrode or a composite cathode, it is the examiner's position that it would have been within the level of ordinary skill of a worker in the art at the time of the invention to select suitable electrode materials and combinations of electrode materials to provide a functional device.

17. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (703) 308-4413. The examiner can generally be reached at this number from 6:45 a.m. to 3:15 p.m. Monday-Friday.

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The current fax numbers for Art Unit 1774 are (703) 305-3599 for official after final faxes and (703) 305-5408 for all other official faxes. (Unofficial faxes for Art Unit 1774 can be sent to (703) 305-5436.)

MRY
01/31/00

Marie R. Yamnitzky

**MARIE YAMNITZKY
PRIMARY EXAMINER**

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